Canada News

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Summer Newsletter

With spring planting complete, our attention now turns towards monitoring crop progress with the goal of achieving optimum production. Plant analysis is invaluable as another set of "eyes" to do just this. The following is associated with plant tissue analysis and, as always, we hope you find this information timely and of value to you. Please do not hesitate to contact us with any questions you might have. We appreciate your business and look forward to doing all we can for you in the coming season.

Plant Tissue Analysis

One of the more important factors affecting crop quality and yield is the nutrient status of the plant or the flow of nutrients to plant tissues during the growing season. Nutrient status is an "unseen" factor in plant growth, except when imbalances become so severe that visual symptoms appear on the plant. Determination of plant nutrient status requires precise laboratory analysis of plant tissue during the growing season.

How Can a Tissue Analysis Help?

A plant tissue analysis will detect unseen hidden hunger and confirm visual deficiency symptoms. Toxic levels may also be detected. Combined with data from a soil analysis, a tissue analysis is an important tool in determining nutrient requirements of a crop.

A complete plant tissue analysis will identify the nutrient status of the following elements:

Nitrogen	Iron
Sulphur	Aluminum
Phosphorus	Manganese
Potassium	Boron
Magnesium	Copper
Calcium	Zinc
Sodium	

Chlorine, molybdenum and other elements maybe useful additions.

Diagnosing Apparent Nutrient Deficiencies

Diagnosis of crop growth is always a challenge. Is poor color in an area of a field solely a nutrient problem, or is it caused by a combination of weather, compaction, and management factors? If it were easy, you wouldn't have been asked to diagnose the problem and suggest a possible remedy.

Researchers suggest taking soil samples in three areas of problem field

- where the crop is growing well, where crop growth is most affected, and from an area where symptoms are just starting to appear. We also suggest taking a plant sample for nutrient analysis from each of these areas.
Comparison of these paired soil and plant analyses should give a much clearer picture of the problem:

1. Check the soil analysis report for low nutrient levels and other factors. Uniformly good soil test levels across these areas would indicate it is not a soil fertility problem,
2. When a plant analysis report indicates a deficiency, check the corresponding soil test results for a low level of that nutrient or soil pH, which can affect nutrient availability. If the plant analysis indicates a deficiency and the soil test is adequate, other environmental and management factors are likely affecting nutrient uptake.
3. When both the soil and plant analysis reports indicate adequate nutrient levels, move on to other possible causes for the symptoms.

This stepwise approach provides the information usually needed to determine the cause of an apparent nutrient deficiency.

PLANT ANALYSIS

Selecting the proper plant part from several plants, at the right stages of growth, and having it analyzed, can reveal the condition of the plants health and is a very good tool to diagnose suspected nutrient problems and monitor fertilization programs.
If plant analysis indicates a nutrient need early in the growing season, an in-season fertilizer application can lead to improved crop yield and quality. We have available detailed feeding programs for crops such as potatoes, tomatoes, vegetables, grapes and orchards. Plant analysis results are usually evaluated by placing the nutrient concentrations into categories:

DEFICIENT - Plants should be showing clear visible symptoms of a nutrient element disorder.

LOW - Plants may be normal in appearance, but they probably will be responsive to fertilization with the low testing nutrient element.

SUFFICIENT - Plants are normal appearance and have an adequate concentration of the nutrient element for maximum expected yield.

HIGH - Plants are normal in appearance, and optimum yield levels can be expected. The concentration of this nutrient element is higher than expected.

EXCESS - Plants have either clear visible symptom of a nutritional disorder or have a normal appearance. Yield may be reduced significantly because of the excess of the nutrient element.

The desired situation is for all element concentrations to be in the sufficient range so that crop growth is not limited by nutrition. Plant analysis, therefore, is a "tool" to help you take a "closer look" to learn if you have adequate, balanced crop nutrition.

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A & L Plant Report

Report Number: C03175-509
Account Number: 14000

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PLANT ANALYSIS REPORT

To: A&L CANADA
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LONDON

For: Field One
Research

Sample ID: 1
Plant Type: Corn Leaf (Early)
Growth Stage: early growth
Plant Part: Leaf

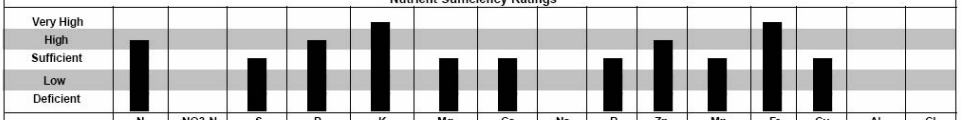
519-457-2575

Date Received: 24/06/03 Date Reported: 02/07/03

Date Sampled	Lab Number	Nitrogen (%)	Nitrate Nitrogen (%)	Sulfur (%)	Phosphorus (%)	Potassium (%)	Magnesium (%)	Calcium (%)	Sodium (%)	Boron (ppm)	Zinc (ppm)	Manganese (ppm)	Iron (ppm)	Copper (ppm)	Aluminum (ppm)	Chloride (%)
23/06/03	175519	4.70		0.28	0.60	5.00	0.21	0.51	0.02	11	72	42	894	14	425	
Normal Range		3.49 4.50		0.17 0.40	0.30 0.50	1.99 3.59	0.19 0.60	0.20 0.80		5 25	25 70	19 150	24 200	5 20		

	N/S	N/K	P/S	P/Zn	K/Mg	K/Mn	Fe/Mn	Ca/B
Actual Ratio	16.8	0.9	2.1	83	23.8	1182	21.1	451
Expected Ratio	13.0	1.3	1.3	80	7.5	375	1.3	430

Nutrient Sufficiency Ratings



N	NO3-N	S	P	K	Mg	Ca	Na	B	Zn	Mn	Fe	Cu	Al	Cl

- The very high level of IRON in this sample is probably due to contamination with dust or soil particles, and may not reflect the true iron content.

A&L Canada is a laboratory accredited by Standards Council of Canada / CAEAL and OMAFRA.

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Plant Analysis Monitoring

Unfortunately, crop yield can already be affected by the time visual symptoms of nutrient deficiencies are present. Monitoring nutrient concentrations on a regular basis throughout the growth cycle provides multiple opportunities to evaluate the plants' nutritional condition to predict and "head off" nutrient deficiencies or excess that can affect crop yield and quality. For this reason, we have developed a **Plant Monitoring Program (PMP).**
Plant analysis monitoring is commonly used for vegetable and fruit crops. These crops take up large amounts of nutrients in a short period of time with root systems that are relatively small for the amount of nutrient needed (most vegetables) or that are large but explore soil that may be low in nutrients (tree fruits such as apples).

Potatoes are one of several crops that benefit from an intensive **Plant Analysis Monitoring (PMP) Program.** Potato petiole (leaf stem) samples collected and analyzed for nutrient levels on a weekly basis can indicate whether in-season fertilizer applications are needed to maximize yield and quality. For example, nitrogen is commonly applied to potatoes at regular intervals during the growing season. If the nitrate-nitrogen level of the potato petiole is too low for the current plant growth stage, the N rate probably needs to be increased. If the nitrate-nitrogen level is too high for that growth stage, the N rate probably needs to be decreased or the scheduled application delayed. Similar decisions can be made based on analysis results of other nutrients.

Our **Plant Analysis Monitoring Report** graphs analysis of 14 nutrients by sampling date. This report can be e-mailed to you the same day analysis is completed for quick decision-making. **Contact us for more information or to enroll in our Plant Analysis Monitoring (PMP) Program**.

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Plant Monitoring Report

Report Number: C01180-502
Account Number: 60005

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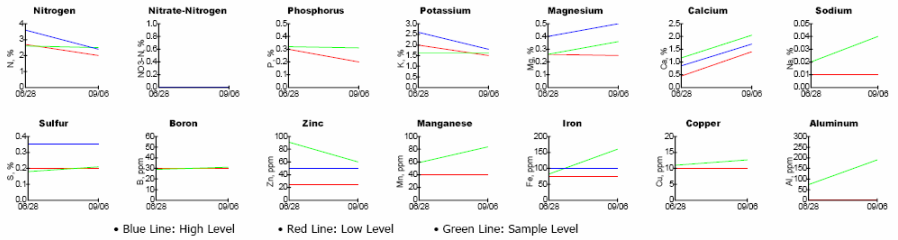
PLANT ANALYSIS MONITORING REPORT

To: For: Sample ID:
Grower Code: Plant Type:
Field: Plant Part:
Variety:
PMID: Date Received: 07/03/2001 Date Reported: 01/17/2005 Page: 1

Date Sampled	Lab Number	Nitrogen (%)	Nitrate Nitrogen (%)	Sulfur (%)	Phosphorus (%)	Potassium (%)	Magnesium (%)	Calcium (%)	Sodium (%)	Boron (ppm)	Zinc (ppm)	Manganese (ppm)	Iron (ppm)	Copper (ppm)	Aluminum (ppm)	Chloride (%)
06/28	180506	2.60		0.18	0.32	1.62	0.26	1.16	0.02	29	91	59	82	11	74	
09/06	250508	2.50		0.21	0.31	1.61	0.36	2.05	0.04	31	60	84	160	13	190	
Normal Range (Most Recent Sample)		2.00 2.40		0.20 0.35	0.20 0.50	1.50 1.80	0.25 0.50	1.40 1.70	0.01 0.05	30 60	25 50	40 100	75 100	10 20	1 300	

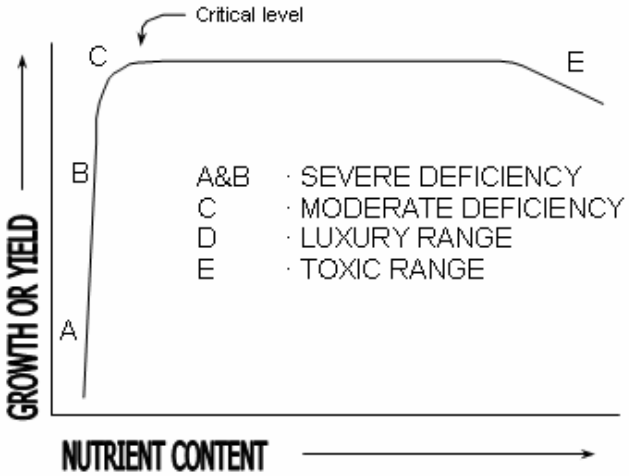


• Blue Line: High Level • Red Line: Low Level • Green Line: Sample Level

INTERPRETING PLANT ANALYSES

Plant analysis measures the concentration of nutrients in a plant tissue. The analysis is based on the concept that the nutrient level present is a result of all factors affecting the plant's growth. The relationship between nutrient content and crop growth is indicated in the graph below.

As nutrients are added, growth increases to an optimum level. Nutrients that have been added beyond the critical level will continue to accumulate in the plant tissue without any further yield increase. Continued concentration of nutrients in the plant tissue may eventually cause toxicity.



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A&L Canada uses the critical level approach in interpreting plant analyses. The point below which yields decrease or deficiency symptoms appear is the critical level. This approach requires that the plant tissue being analyzed be compared with critical levels that have been predetermined for a particular plant part and stage of growth.

It is very important that soil analysis data and field observations are used in conjunction with a plant analysis report. The more information available, the easier it is to understand the data.

FIELD OBSERVATIONS

Crop diagnosis requires knowledge of the plant's environmental conditions. Factors that influence crop growth also affect nutrient uptake and concentration in the plant's tissue.

Plant Appearance - Does the plant appear to be healthy or under stress? Is there stunting or discoloration? Stunted or discolored plants are often low in one or more nutrients. Nutrient levels usually appear abnormally low or high in severely stunted, nearly dead, or dead plants.

Root Growth - Anything that restricts root growth can reduce nutrient uptake. Shallow, compacted, wet or poorly drained soils result in shallow root systems and therefore poor nutrient uptake. With shallow root systems, deficiency symptoms often occur even though the soil contains adequate nutrients. Insects, diseases, fertilizer burn, and herbicide damage may cause root injury and also contribute to reduced nutrient uptake.

Soil Moisture - Plants have difficulty absorbing nutrients in dry soil. Therefore, tissue concentrations may be lower than normal. Potassium and other nutrient deficiencies commonly occur in crops during dry years even though the soil test shows adequate amounts.

Air and Soil Temperature - Plant growth is slow, root systems are small, and nutrient uptake is low in cold soil. Low temperatures may cause deficiency symptoms to appear early in the spring that the plant "grows out of" as the season progresses.

Tillage and Fertilizer Placement - Tillage practices will influence soil temperature, moisture, aeration, and will therefore affect nutrient uptake. Fertilizer placement may influence nutrient availability and may, depending upon conditions, either enhance or reduce nutrient uptake.

Hybrid or Variety - Root systems may vary among varieties. Those with inefficient or weak roots may show low nutrient uptake under stressful conditions. Uptake and utilization of nutrients may also be influenced by the plant's genetic makeup.

SOIL TEST DATA

Although soil tests estimate the available supply of nutrients in the soil, there is no assurance that the plant can take up these nutrients. Nutrient deficiencies commonly occur because the soil is infertile, but it must be recognized that there are other factors that affect uptake and cause deficiency symptoms to appear.

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Soil Test Levels - Soil test values do not always agree with nutrient levels in the plant tissue. If root growth is being restricted, it is likely that deficiencies will appear in the plant even though the soil test shows adequate amounts.

The reverse can also occur whereby the soil test shows nutrient deficiencies and the plant tissue shows adequate amounts. Soil tests often indicate low or deficient amounts of sulfur or micronutrients when the plant tissue sample indicates sufficiency. In this case, the plant tissue is a better indicator of nutrient availability that is the soil test.

Nutrient deficiencies are often related to soil pH. Some nutrients decrease in solubility in high pH soils to the point that deficiencies may appear. Manganese and aluminum, on the other hand, become soluble in very acid soils. This may create toxic conditions along with increased concentrations of these elements in the plant tissue.

Interactions - High concentrations of one element may induce a deficiency of another element. For example, a high amount of phosphorus may cause a zinc deficiency. A high level of potassium may induce a magnesium deficiency. High rates of ammonia nitrogen may reduce concentrations of potassium in the plant.

Stage of Growth - The nutrient concentration that is considered adequate will change as the plant grows and matures. Young actively growing leaves usually contain higher concentrations of nutrients than older leaves.

Plant Part - Different parts of plants contain and accumulate varying amounts of nutrients. Generally, upper, recently matured leaves are sampled. *It is advisable, however, that sampling instructions be followed for each crop.*

Soil Contamination - Soil particles in or on the leaves will elevate iron and aluminum values. A plant sample should be wiped clean in the field to avoid contamination. Do not wash samples prior to analyses because certain water-soluble nutrients may be lost.

SOFTWARE FOR INTERPRETING TISSUE ANALYSES

A&L Canada has available a simple computer program that will assist you in understanding tissue analysis.

DEVIATION FROM OPTIMUM PERCENTAGE or "DOP" is a new methodology for plant mineral analysis interpretation and diagnosis that can provide information both on the qualitative and quantitative aspects of nutrition. DOP allows for simultaneous evaluation, in a given sample, of the nutrient concentrations, nutritional balance and order of limitation of nutrient contents.

For more information on software and availability please contact the laboratory at (519) 457-2575.

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Collection and Preparation of the Sample

Correct interpretation cannot be made unless proper sampling procedures are followed. The sample must also be in good condition when the laboratory receives it.

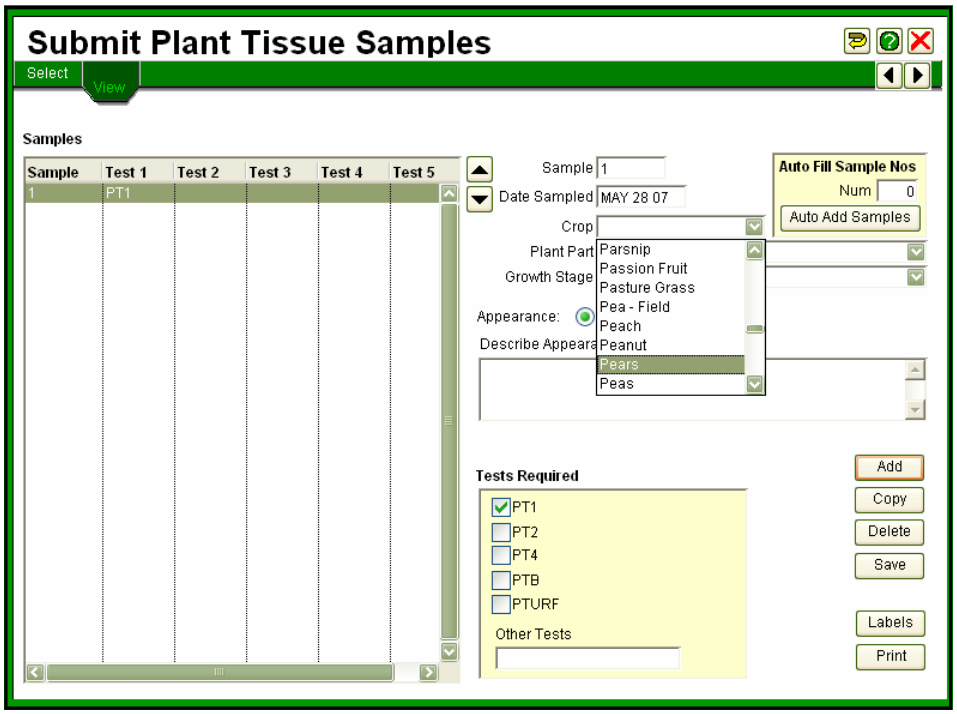
When collecting samples, be sure to use a clean container. Never use a metal container as the metal may contaminate the sample. Generally, two cups of lightly packed material provides a sufficient amount to conduct an analysis; one cup may be sufficient if gathering petioles. Either air dry samples for one day (below 176 degrees F) or ship as soon as possible in perforated bags to allow air movement and a degree of drying in transit.
Never send fresh samples in sealed plastic bags unless kept cool. Never freeze samples. Do not include roots with samples for nutrient analysis unless required.

Tissue analysis results are available within 24 hours of the sample being received at the lab. For optimum efficiency, we encourage samples to be obtained at the beginning of the week for delivery to the laboratory and analysis. This scenario enables the grower to react, if necessary, to the laboratory results immediately by avoiding the untimely delay of samples being detained in transit over a weekend. A tissue guide identifying the correct portion of the plant to sample at specific growth stages can be obtained on our web site at www.alcanada.com. Following these sampling procedures will ensure you obtain the most accurate analysis and best interpretation.

Tissue Sample Supplies

A & L Laboratories will provide plant tissue sample bags, as well as plant tissue submittal forms at no charge on request. Submissions can also be made on-line. The information you receive on our reports is as accurate as the information submitted with your sample. For this reason, please fill out all submittal forms as accurately, completely and legibly as possible.

Online Data-web submission forms



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Interpretation of Irrigation Water Analysis

The concentration and composition of dissolved constituents in water combined with the amount of water used determines its quality for irrigation. Crops vary in their tolerance to various components of irrigation water. Soils also vary in their capacity to resist adverse changes due to components of the water. A comprehensive water analysis will indicate its suitability for irrigation use.

SODIUM

Sodium is the most troublesome of the major constituents of irrigation water. Excessive sodium can cause soil physical problems. Sodium salts can reduce water uptake by plant roots.

CALCIUM/ MAGNESIUM

These cations are essential plant nutrients. Both calcium and magnesium are associated with soil aggregation and friability. Large quantities of calcium and magnesium in irrigation water can increase soil pH, resulting in reduced availability of trace elements and phosphorus.

CHLORIDE

High levels of chloride can cause leaf burn and root toxicity.

CONDUCTIVITY/ TOTAL DISSOLVED SOLIDS

Conductivity/TDS is used as a general measure of water quality. High levels of these parameters usually mean high levels of dissolved minerals and salts.

SULFUR

Sulfur is essential for plants. Most sulfur in irrigation water is usually present in the sulfate form. It is important as a nutrient in irrigation water where there is low available sulfur from other sources.

Nitrate-N

Nitrogen in irrigation water can be used by the plant. Excessive levels of nitrogen may cause delayed maturity in certain crops.

pH

Most water supplies have a pH between 6.5 and 8.0. Waters which are too acidic or too alkaline can have a detrimental affect on plant development.

BICARBONATES/ CARBONATES

High levels of carbonate and/or bicarbonate will remove calcium and magnesium from the soil clay complex. This may leave sodium in their place resulting in an alkali soil condition.

PHOSPHORUS/POTASSIUM

These elements are essential plant nutrients. If present in the irrigation water they can help supply some of the plant's requirements.

BORON

Boron is an essential plant nutrient, however at high levels, it can be toxic to plants. Crops vary greatly in their tolerance to boron.

SODIUM ABSORPTION RATIO (SAR)

SAR is an index of the sodium hazard of water. It is based on the ratio of sodium to calcium and magnesium.

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SAMPLE COLLECTION

Use a clean 16oz glass or plastic container with a leak-proof lid. Samples from wells should be taken after the pump has been running for a least 1/2 hour. The sample can be caught directly from the pump discharge. If the sample is taken from a stream, it should be collected from running water during the irrigation season. Send the sample to the laboratory as soon as possible after collection.

INTERPRETIVE GUIDELINES FOR IRRIGATION WATER ANALYSIS				
Parameter	Units	Potential Problems		
		None	Increasing	Severe
Sodium (Na)	mg/l	<70	71-180	>180
Chloride (Cl)	mg/l	<70	71-300	>300
pH	—	5.5-7.5	<5.5 or >7.5	<4.5 or >8.5
Bicarbonate (HCO_3)	mg/l	<40	41-180	>180
Carbonate (CO_3)	mg/l	<15	16-20	>20
Conductivity	mmhos/cm	<0.75	0.76-3.0	>3.0
Boron	mg/l	<0.5	0.6-2.0	>2.0
Sodium Absorption Ratio (SAR)		<3	4-6	>6

ABBREVIATIONS, CONVERSIONS AND EQUIVALENTS

mg/l	=milligrams per liter	ug/l	=micrograms per liter
mmhos/cm	=unit of conductance	EC	=electrical conductance
>	= more than	<	less than
SO_4-S	= SO_4^- x 0.333	NO_3^--N	= NO_3^- x 0.226
TNTC	= too numerous to count	17.1 mg/l	= 1.0 grain/gallon
mg/l x 0.23	= lbs/acre inch	mg/l x 2.72	= lbs/acre foot
gpm	= gallons per minute	450 gpm	= 1 acre inch per hour

As a final note to this newsletter, we, at A&L, wish to thank the London Chamber of Commerce for the recent honour they bestowed upon us by nominating A&L Canada for the 2007 Quality Award. We where recognized at the 24th Annual Business Achievement Awards at the London Convention Centre March 21/07. It was indeed a pleasure to be nominated and recognized within the business community, particularly for Quality, an area we take considerable pride in.

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